Idaho Department of Environmental Quality
Air Quality Division
Stationary Source Program

STATE OF IDAHO

AIR QUALITY MODELING GUIDELINE

Doc. I D AQ-011 (rev. 1 12/31/02)

DISCLAIMER

This document does not have the force and effect of a rule and is not intended to supersede statutory or regulatory requirements or recommendations of the state of Idaho or the Environmental Protection Agency. It is provided as general guidance and does not alter the discretionary authority of the Department of Environmental Quality to protect public health.

Mary Anderson	12-31-02
Modeling Coordinator	Date
	12-31-02
Stationary Source Program Manager	Date
	12/31/02
Division Administrator	Date

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CONVERSION TABLE

Conversion Factors

Multiply # of	→	by	→	to obtain # of
to obtain # of	→	by	→	Divide # of

cubic meters (m^3)	35.314	cubic feet (ft^3)
cubic meters	264.17	gallons (gal)
cubic feet	7.48052	gallons
cubic feet	28.32	liters (L)
hectares (ha)	2.471	acres (ac)
kilograms (kg)	2.205	pounds (lbs)
liters	0.2642	gallons

ACRONYMS

acfm	actual cubic feet per minute
AERMIC	American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement
AQCR	Air Quality Control Region
AQRV	Air Quality Related Value
BPIP	Building Profile Input Program
Btu	British thermal unit
CO	carbon monoxide
DEM	Digital Elevation Model
DEQ	Department of Environmental Quality
EL	Screening Emission Level
EPA	Environmental Protection Agency
FIA	Full Impact Analysis
ft	feet
GEP	Good Engineering Practice
H_2S	hydrogen sulfide
IDAPA	A numbering designation for all administrative rules in Idaho promulgated in accordance with the Idaho Administrative Procedures Act.
ISCST3	Industrial Source Complex, Short Term Ver. 3; a refined air pollution model
K	Kelvin
lb/hr	pounds per hour
mg/m^3	milligrams per cubic meter
mrem/yr	millirem per year
NAA	Nonattainment Area
NAAQS	National Ambient Air Quality Standards
NO_2	nitrogen dioxide
NO_x	oxides of nitrogen
NWS	National Weather Service
PA	Preliminary Analysis
Pb	lead
$PM_{2.5}$	Particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers
PM_{10}	Particulate matter with an aerodynamic diameter less than or equal to 10 micrometers
PSD	Prevention of Significant Deterioration
PTC	Permit to Construct
SCL	Significant Contribution Level
SCREEN3	An air pollution model used to establish the general distance to the maximum concentration from the facility
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
TAP	Toxic Air Pollutant
T/yr	Tons per Year
URF	Unit Risk Factor

USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator
VOC	Volatile Organic Compounds
°F	Degrees Fahrenheit
$\mu g/m^3$	micrograms per cubic meter

1.0 Introduction

This guideline is intended to help air permit applicants, air quality specialists, and others understand the Department of Environmental Quality's (DEQ) expectations for ambient air impact analysis and to prevent unnecessary delays in the permit process. This guideline does not have the force and effect of a rule and is not intended to supersede statutory or regulatory requirements or recommendations of the state of Idaho or the Environmental Protection Agency (EPA). It is provided as general guidance and does not alter the discretionary authority of DEQ to protect public health.

Some knowledge of air dispersion and air quality assessment is needed to fully understand and use this guideline. The purpose of air quality modeling, for permitting purposes, is to demonstrate that all applicable ambient air quality standards will be met if proposed construction or a modification is completed, or to demonstrate an existing facility's compliance with the standards. If the construction or modification causes or significantly contributes to a violation of an ambient air quality standard, results in an impact above applicable Prevention of Significant Deterioration (PSD) increment limits, or has a significant impact in a Class I or nonattainment area (NAA), DEQ cannot issue a permit for the proposed facility. The air quality modeling performed must demonstrate compliance with all appropriate rules and regulations; otherwise, the facility's permit application will need to be revised, additional modeling will need to be performed, or the permit will be denied.

Demonstrating compliance with the National Ambient Air Quality Standards (NAAQS), toxic air pollutant (TAP) standards, and PSD increments is required by the state of Idaho. DEQ has determined that this demonstration generally requires the applicant to perform an air quality modeling analysis. Permitting actions that generally require air quality modeling include:

- Permits to construct (IDAPA 58.01.01.200)
- Permit to construct exemptions (IDAPA 58.01.01.220)
- Tier II operating permits (IDAPA 58.01.01.401)

The extent of the required modeling will vary from one source to another. For simple facilities (e.g., one or two point source(s) and one building), compliance may be shown by using simple screening techniques such as the SCREEN3 model or other applicable screening models. No further modeling will be required if compliance can be properly demonstrated with the use of a screening model. Sources that cannot properly demonstrate compliance using screening techniques will be required to use more refined model(s) with representative meteorological data in their analyses. Complex multi-point emitting sources, sources with unusual pollutant dispersion environments, or facilities with multiple buildings, for which screening techniques are not applicable, are also required to use more refined modeling techniques. Also, facilities submitting PSD applications are required to perform more extensive analyses than when submitting a minor source application. This guideline focuses on the requirements for non-PSD applications. Facilities submitting a PSD application should refer to the *New Source Review Workshop Manual* (EPA 1990) for additional guidance.

This guideline follows the *Rules for the Control of Air Pollution in Idaho* (IDAPA 58.01.01), EPA guidance in the *New Source Review Workshop Manual* (EPA 1990), and the *Guideline on Air Quality Models* (EPA 2001). The July 2001 version of the *Guideline on Air Quality Models* was used to develop this guideline. However, the most current version of the *Guideline on Air Quality Models* should always be used.

The *Guideline on Air Quality Models* recommends:
"…air quality modeling techniques that should be applied to State Implementation Plan (SIP) revisions for existing sources and to new source review, including prevention of significant deterioration (PSD). It is intended for use by EPA Regional Offices, in judging the adequacy of modeling analyses performed by EPA, State and local agencies and by industry. The guidance is appropriate for use by other Federal agencies and by State agencies with air quality and land management responsibilities."

2.0 When Modeling is Required

A modeling analysis is generally required with each permit application for new construction or a modification that result in an increase in emissions of pollutants for sources permitted by DEQ. The types of permits that require a facility to demonstrate compliance with the NAAQS are permits to construct (IDAPA 58.01.01.200) and Tier II operating permits (IDAPA 58.01.01.400). A modeling analysis may also be required to demonstrate compliance with the TAP standards (IDAPA 58.01.01.210). Most permit to construct exemptions also require (IDAPA 8.01.01.220) the facility to demonstrate compliance with the NAAQS. The only exempted sources that do not require a facility to demonstrate compliance with the NAAQS are those listed in IDAPA 58.01.01.222.02.

DEQ has established modeling thresholds, below which modeling is generally not required. These modeling thresholds are based on a modeling analysis performed by DEQ. This modeling analysis demonstrated compliance with NAAQS for emission rates below the modeling thresholds. The modeling analysis was based on the limitation that the Significant Contribution Levels (SCLs) would not be exceeded and, therefore, a full impact analysis would not be required. Table 1 presents modeling thresholds for criteria pollutants (i.e., carbon monoxide (CO), particulate matter with an aerodynamic diameter less than or equal to 10 micrometers (PM_{10}), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), and lead (Pb)). Modeling is generally required to quantify the impact if the emission rate is equal to or greater than these long-term (tons per year) and or short-term (pound per hour, etc.) emission thresholds. If the emission rate is less than the threshold, a qualitative description of the impact is adequate, unless there is a situation that warrants modeling. These situations are included in the footnotes of Table 1. For TAPs, the emission increase is compared to the screening emission level (EL) in IDAPA 58.01.01.585 and 586. Modeling is required for those TAPs that have emission increases that are equal to or greater than the ELs.

Table 1. Modeling thresholds for criteria pollutants.

Pollutant	Potential Emission Rate from a New Source or Facility-wide Net Emissions Increase from a Modification
CO	14 pounds per hour
NO_x	1 ton per year
SO_2	1 ton per year or 0.2 pound per hour
PM_{10}	1 ton per year or 0.2 pound per hour
Pb	0.6 ton per year or 100 pounds per **month**

1. Sources where a substantial portion of the new or modified emissions have poor dispersion characteristics (e.g., rain caps, horizontal stacks, fugitive releases, or building downwash) in close proximity to ambient air
2. Sources located in complex terrain (e.g., terrain above stack height in close proximity to the source)
3. Sources located in areas with poor existing air quality
4. Modifications at existing major stationary sources, including grandfathered sources that have never been modeled before

Note, these thresholds are based on the following assumptions: ISCST3 using 5 years of meteorological data (1987 – 1991) from Spokane, Boise, and Pocatello. The highest value was taken and compared to the significant contribution levels. Stack height = 30 ft, exit temperature = 150 °F, diameter = 1 ft, exit velocity = 32.8 feet per second, exit flow rate = 1546 actual cubic feet per minute, ambient air is 100 feet from stack in all direction, building of 12.5 ft (w) by 12.5 ft (l) by 15 ft (h).

3.0 Applicable Standards

This section discusses the applicable standards for ambient air assessments. Table 2 lists the SCLs used to determine whether or not the proposed project would have a significant impact on the air quality in the area. The proposed construction has a significant impact on the ambient air quality if the resulting ambient concentration exceeds these levels due to an emission increase. Table 3 presents the NAAQS.

Table 2. Significant Contribution Levels

Pollutant	Averaging Time	Significant Contribution Levels ($\mu g/m^3$)[a]
CO	1-hour	2000
	8-hour	500
NO_2	Annual	1.0
SO_2	3-hour	25
	24-hour	5
	Annual	1.0
PM_{10}	24-hour	5.0
	Annual	1.0

a. micrograms per cubic meter
Source: IDAPA 58.01.01.006.93

Table 3. National Ambient Air Quality Standards

Pollutant	Averaging Time	Standard ($\mu g/m^3$)[a]
CO	1-hour	40,000[b]
	8-hour	10,000[b]
NO_2	Annual	100[c]
SO_2	3-hour	1,300[b]
	24-hour	365[b]
	Annual	80[c]
PM_{10}	24-hour	150[d]
	Annual	50[c]
Pb (measured as elemental lead)	Quarterly	1.5[e]

a. Micrograms per cubic meter
b. Not to be exceeded more than once per year
c. Not to be exceeded in any calendar year
d. Never expected to be exceeded more than once in any calendar year
e. Not to be exceeded in any quarter of any calendar year
Source IDAPA 58.01.01.577

Applicable TAP standards are listed in IDAPA 58.01.01.585 for non-carcinogens and .586 for carcinogens. The tables found in these IDAPA sections list the ELs in pounds per hour (lb/hr) as well as the acceptable ambient concentrations for non-carcinogens and carcinogens. Note that the concentrations for the non-carcinogens are in units of milligrams per cubic meter (mg/m$^{3)}$ and the concentrations for carcinogens are in units of $\mu g/m^3$.

4.0 Modeling Methodology

In general, the required level of analysis will depend on the complexity of the proposed construction or modification, surrounding sources and terrain features, current air quality levels, and classification in the impact area. Screening techniques may be satisfactory for small or isolated sources. However, screening techniques are not appropriate in complex situations such as when a large number of buildings create downwash for a point source, or when complex terrain is present. More refined modeling will be necessary when screening modeling cannot demonstrate compliance with applicable air quality impact limits. The modeler should check with the DEQ modeling coordinator for current information on the air quality classifications in the vicinity of the facility (Appendix B shows NAAs and Class I status as of the date of this revision), background concentrations, and information on potential nearby sources. DEQ can also help determine the level of analysis required.

4.1 Requirements for PSD and Minor Source Permit Applications

As recommended by EPA (EPA 1990), dispersion modeling analysis generally involves two distinct phases. The first phase is the ***preliminary analysis (PA)***; the second phase is the ***full impact analysis (FIA)***. These analyses may be performed with either a simple "screening model" or with a more complex "refined model." If a screening-level model is used to perform the PA or FIA, it is referred to as a ***screening analysis***. If a refined-level model is used, it is referred to as a ***refined analysis***. A flowchart showing this methodology is presented in Figure 1.

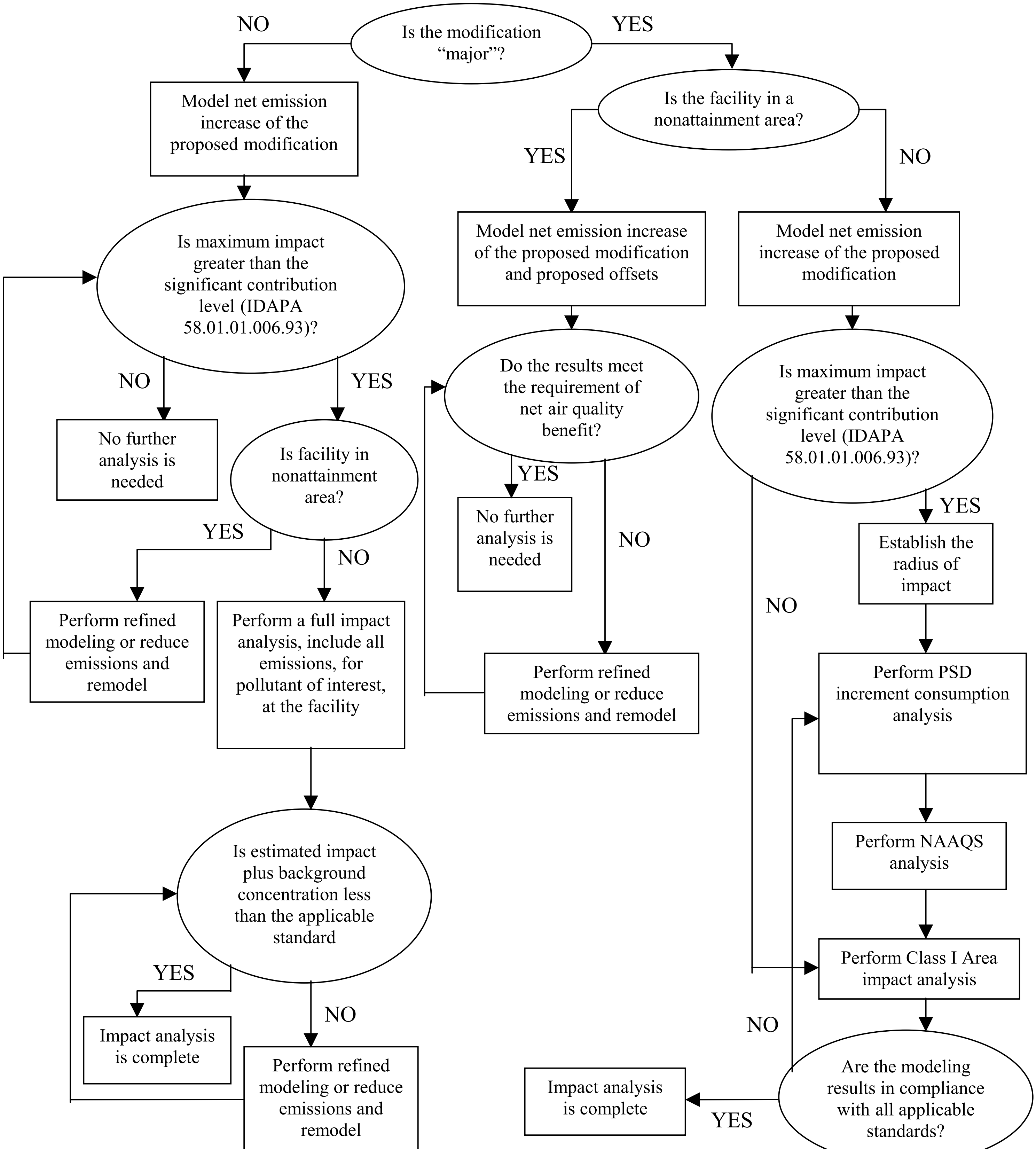

Figure 1. Flow chart for criteria pollutant ambient impact analysis for permit to construct application.

4.1.1 Preliminary Analysis

In the PA, the ***highest*** estimated concentration in ambient air is compared to the SCLs in Table 2. Only the emission increase is modeled in the PA. Impacts from nearby and other background sources, including background concentrations, are not considered in the PA. Generally, no further analysis is required for the NAAQS or PSD increments if the estimated concentration is below applicable SCLs. The source or modification is determined to have a significant impact on ambient air if the estimated impact exceeds the SCLs. In this case, a FIA may be necessary to demonstrate to the satisfaction of DEQ that the stationary source or modification would not cause or significantly contribute to a violation of any ambient air quality standard. Also, if DEQ has information that indicates existing facility emissions may not meet NAAQS, then DEQ may use its discretion and require the facility to demonstrate full NAAQS compliance at the time of the current permitting action or a later date.

The ambient concentration due to any proposed construction of modification cannot exceed the SCLs listed in Table 2 for minor stationary sources in NAAs. Offsets are required even if the ambient impacts are below the SCLs for major stationary sources or major modifications at major stationary sources in NAAs. The NAAs in Idaho are shown in Appendix B.

4.1.2 Full Impact Analysis

In a ***FIA***, the scope of the analysis is expanded from the PA to include impacts from all other sources at the facility and background. Other co-contributing sources may be required per DEQ's discretion for minor source permit applications. DEQ would review this situation on a case-by-case basis. The factors to be reviewed include the type of source, distance between the facilities, location of potential impact, pollutants emitted, and emission rates of pollutants of interest.

When conducting NAAQS modeling for minor source applications, the sources not explicitly included in the model (e.g., mobile sources; small, stationary sources; fugitive sources; and large, distant sources) are accounted for by adding a background concentration representative of the air quality in the area. This background concentration must be obtained from a DEQ air quality modeler. Facilities are allowed to analyze the background concentrations to assess their facility's impact on the monitor. The facility is strongly encouraged to submit a methodology/protocol for this analysis prior to the submittal of the application. For those pollutants that exceed the SCLs, PSD permit modeling assessments must include emissions from all sources within the radius of significant impact and all sources outside the radius of significant impact that cause a significant impact within the radius of significant impact.

4.2 Additional Requirements for PSD Applications

Major facilities subject to PSD rules have many more responsibilities in the permitting process. DEQ engineers make the final determination of PSD applicability.

A PSD review is required if a proposed, new facility is defined as a designated facility (Table 4) and emits or has the potential to emit, after controls, 100 tons per year (T/yr) or more of any regulated air pollutant. If the new facility is not listed in Table 4, then a PSD review is required if the facility emits or has the potential to emit, after controls, 250 T/yr or more of any regulated air pollutant. For PSD review, the potential to emit is defined as the maximum capacity of a stationary source to emit a pollutant under its physical and operational design (IDAPA 58.01.01.006.74).

A PSD review is also required if proposed emissions from a modification to an existing PSD major source are greater than the significant emission rates listed in Table 5. The location of the facility is important, as it determines the applicable increment of allowable deterioration. Other factors, such as the topography and meteorology of the area and the proximity to a Class I or NAA, also determine the control requirements. The allowable increments, as of the publication of this document, for Class I, II, and III areas are listed in Table 6. Additional increment limits can be promulgated by the EPA or DEQ, so it remains the applicant's responsibility to verify applicable PSD increment limits. The Class I areas in Idaho and surrounding states are shown in Appendix B. The remainder of the state is currently designated as Class II. There are no Class III areas in Idaho.

Pre-construction air quality is determined through ambient air monitoring. In some cases, there may already be enough data to establish the baseline. However, the applicant may be required to conduct up to one year of ambient monitoring at strategic locations if monitoring data is not available for the source area of the proposed construction site. Pre-construction monitoring will automatically be required if the model-predicted impact of the proposed source exceeds the levels in Table 7 and there is no current ambient air monitoring available. DEQ has the discretion to require monitoring in other situations.

The following additional analyses are required in PSD applications:

- PSD increment consumption
- Class I area visibility analysis
- Growth analysis
- Ambient air quality impact analysis (during construction)
- Soils and vegetation impacts
- Visibility impairment (in impact area, separate from the Class I area visibility analysis)

Refer to the *New Source Review Workshop Manual* (EPA 1990) for additional guidance.

Table 4. Designated Facilities

1.	Fossil fuel-fired, steam electric plants of more than 250 million British thermal units (Btu) per hour heat input
2.	Coal cleaning plants (with thermal dryers)
3.	Kraft pulp mills
4.	Portland cement plants
5.	Primary zinc smelters
6.	Iron and steel mill plants
7	Primary aluminum ore reduction plants
8.	Primary copper smelters
9.	Municipal incinerators capable of charging more than 250 tons of refuse per day
10.	Hydrofluoric acid plants
11.	Sulfuric acid plants
12.	Nitric acid plants
13.	Petroleum refineries
14.	Lime plants
15.	Phosphate rock processing plants
16.	Coke oven batteries
17.	Sulfur recovery plants
18.	Carbon black plants (furnace process)
19.	Primary lead smelters
20.	Fuel conversion plants
21.	Sintering plants
22.	Secondary metal production plants
23.	Chemical process plants
24.	Fossil fuel boilers (or combination thereof) totaling more than 250 million Btus per hour heat input
25.	Petroleum storage and transfer units with a total storage capacity exceeding 300,000 barrels
26.	Taconite ore processing plants
27	Glass fiber processing plants
28.	Charcoal production plants

Source: IDAPA 58.01.01.006.27

Table 5. Significant Emission Rates[a]

Pollutant	Emission Rate (T/yr)
CO	100
NO_X	40
SO_2	40
PM_{10}	15
Particulate matter	25
Ozone (VOC[b])	40 (of VOCs)
Pb	0.6
Asbestos	0.007
Beryllium	0.0004
Mercury	0.1
Vinyl chloride	1
Fluorides	3
Sulfuric Acid Mist	7
H_2S[c]	10
Total Reduced Sulfur (including H_2S)	10
Radionuclides from facilities regulated under 40 CFR Par 61, Subpart H	0.1 mrem/yr[d]
Reduced sulfur compounds (Including H_2S)	10
Any other pollutant regulated under the Clean Air Act including radionuclides	Any emission rate
Each regulated pollutant (from a major facility or major modification)	Emission rate that causes air quality impact of 1 µg/m^3 or greater (24-hour basis) in any Class I area located with 10 kilometers of the source

a. Extracted from 40 CFR 52.21 (b)(23) and IDAPA 58.01.01.006.92. A PSD review is required if the operation is modified and actual emissions of a pollutant will be greater than shown above

b. Volatile organic compound

c. Hydrogen sulfide

d. Millirem per year

Table 6. Prevention of Significant Deterioration Increment Limits[a]

Pollutant/Averaging Period		CLASS I[b] ($\mu g/m^3$)	CLASS II[b] ($\mu g/m^3$)	CLASS III[b] ($\mu g/m^3$)
SO_2	Annual[c]	2	20	40
	24-hour[d]	5	91	182
	3-hour[d]	25	512	700
PM_{10}	Annual[c]	4	17	34
	24-hour[d]	8	30	60
NO_2	Annual[c]	2.5	25	50

a. This table shows increment limits applicable in April 2001. Additional increment limits for other pollutants or changes in these increment limits are possible. It is the applicant's responsibility to verify applicable increment limits.
b. The Class I, II, and III areas are defined and shown in Appendix B
c. Never to be exceeded
d. Not to be exceeded more than once a year

Source IDAPA 58.01.01.581

Table 7. Prevention of Significant Deterioration Monitoring Levels

Pollutant	Ambient Concentration ($\mu g/m^3$)	Averaging Period
CO	575	8-hour
NO_2	14	Annual
PM_{10}	10	24-hour
SO_2	13	24-hour
Ozone	100 T/yr increase of VOCs	N/A
Pb	0.1	Quarterly
Mercury	0.25	24-hour
Beryllium	0.0001	24-hour
Fluorides	0.25	24-hour
Vinyl chloride	15	24-hour
Hydrogen sulfide	0.2	1-hour

Source: *New Source Review Workshop Manual* (EPA 1990) and IDAPA 58.01.01.202.c.viii..

5.0 Performing an Ambient Air Quality Analysis

An application will not be considered complete, and may be returned by DEQ, if the application lacks sufficient information and/or a valid modeling analysis. Appendix C includes a copy of the DEQ modeling checklist, which is designed to help the applicant prepare the information necessary for a complete modeling package.

The procedure in this document, as well as the EPA documents *Guideline on Air Quality Models* (EPA 2001) and *New Source Review Workshop Manual* (EPA 1990), should be followed when conducting the modeling analysis. This document provides guidance on appropriate model applications. DEQ will work with the applicant to determine acceptable impact assessment procedures where EPA or state policies are not clear or involve case-by-case review.

5.1 Modeling Protocol

It is recommended that the applicant contact the DEQ air quality modeling coordinator at (208) 373-0502 or submit a modeling protocol, as suggested in the modeling checklist (Appendix C), to ensure appropriate models, meteorological data, and procedures are being applied. The content of the modeling protocol is dependent on the type of permit application. A modeling protocol for a new, major source or a major modification at a major facility will be more detailed than one for a new, minor source or a minor modification. Two modeling protocol checklists, major and minor sources, are presented in Appendix D. General methodology, as well as justification for assumptions, is appropriate for the modeling protocol. A modeling protocol, in written form and agreed upon by DEQ, provides the applicant the assurance that their approach and methodology will be accepted. **However, the approval of a modeling protocol is not meant to imply approval of a completed dispersion modeling analysis.** In order to increase the likelihood of having the modeling analysis approved, the facility should submit as much detailed information as possible in the modeling protocol.

5.2 Choosing the Appropriate Models

Air quality models approved by the EPA for regulatory use are required (IDAPA 58.01.01.202.02 and 58.01.01.402.03). The DEQ modeling coordinator should be consulted to discuss or verify the model most appropriate for the release being simulated. Factors to consider when determining the appropriate model include, but are not limited to, type of release (e.g., elevated point or area), downwash, location of ambient air, meteorological conditions (e.g., stagnation), and availability of meteorological data. All modeling must use the current versions of models recommended in the EPA's *Guideline on Air Quality Models* (sections 3.0 and 4.0) (EPA 2001). Many of these models can be found on the EPA's Support Center for Regulatory Air Models (SCRAM) Web site (http://www.epa.gov/scram001/index.htm). **Modeling performed with older versions may be rejected.** Any modification or alteration of a guideline model must be approved by DEQ **and the EPA.** Approval of the use of other models is completely at the discretion of DEQ. When alternative models are used, DEQ may require the submittal of additional data (e.g., sensitivity analysis) for verification. The use of **proprietary models (those models that are not available free of charge to the public)** is generally not allowed for the demonstration of compliance with NAAQS, PSD increment, or TAPs increments.

The following is a summary of the most commonly used air quality models:

SCREEN3 – The most commonly used screening model, which uses worst case meteorological conditions to estimate worst case 1-hour concentrations for point, area, flare, and volume sources. This model can estimate concentrations in the cavity zone and concentrations due to inversion break-up and shoreline fumigation. SCREEN3 is a screening version of the ISC3 model.

CTSCREEN (Complex Terrain Screening model) –A screening technique when complex terrain is important. CTSCREEN is a screening version of the CTDMPLUS model. CTSCREEN and CTDMPLUS are the same basic model. The primary difference is that CTSCREEN uses an extensive array of predetermined meteorological conditions where site-specific meteorological data are not available.

ISCST3 (Industrial Source Complex Model) – Currently, the most commonly used refined Gaussian plume model. ISCST3 can be used to assess pollutant concentrations from a wide variety of sources associated with an industrial complex. This model can account for the following: settling and dry deposition of particles; downwash; point, area, line, and volume sources; plume rise as a function of downwind distance; separation of point sources; and limited terrain adjustment. ISCST3 is not capable of estimating concentrations in the cavity zone (the area near the building). ISCST3 incorporates the COMPLEX1 algorithm for complex terrain.

CTDMPLUS (Complex Terrain Dispersion Model Plus Algorithms for Unstable Situations) – A refined air quality model for use in all atmospheric stabilities with sources located in or near complex topography. Since the model accounts for the three-dimensional nature of plume and terrain interaction, it requires detailed terrain and meteorological data that are representative of the modeling domain.

AERMOD – A committee, the AERMIC (American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Committee), was formed to introduce state-of-the-art modeling concepts into the EPA's air quality models. The AERMIC's focus is on a new platform for regulatory steady-state plume modeling. This platform includes: 1) air turbulence structure, scaling, and concepts; 2) treatment of both surface and elevated sources; and 3) simple and complex terrain. The modeling system has three components: AERMOD - the air dispersion model; AERMET - the meteorological data preprocessor; and AERMAP - the terrain data preprocessor.

CALPUFF – A multi-layer, multi-species, non-steady-state, puff dispersion model that simulates the effects of time- and space-varying meteorological conditions on pollutant transport, transformation, and removal. CALPUFF is most commonly used to assess impacts on Class I areas and can be applied on scales of tens of meters to hundreds of kilometers. It includes algorithms for subgrid scale effects (such as terrain impingement), as well as longer range effects (such as pollutant removal due to wet scavenging and dry deposition, chemical transformation, and visibility effects of particulate matter concentrations).

VISCREEN – A screening model to assess visibility impacts on Class I areas. Calculates the potential impact of a plume of specified emissions for specific transport and dispersion conditions.

Screening models, such as SCREEN3, are used to simulate the probable worst-case condition under normal, maximum operating conditions. They are generally simplistic representations, typically taking less computer time and yielding conservative impact predictions. A screening analysis must follow EPA guidance in *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised* (EPA 1992). If a properly conducted screening analysis does not detect a problem with the ambient standards from a proposed construction or modification which is isolated from nearby sources, there is no need to continue with a more costly refined analysis. SCREEN3 is not appropriate for facilities with multiple buildings or complex source configurations. Refined models, like ISCST3, can be run in screening mode with worst-case meteorological data when no meteorological data representative of the site is available. If running a refined model in screening mode, discuss the application with the DEQ modeling coordinator prior to submission.

Refined models require more detailed information and generally take more time to prepare, but are typically less conservative. In many cases, screening analyses are inadequate because of the complexity of the proposed source, the screening models built-in conservatism, or the source's location near other sources. Screening models, or refined models run in screening mode, can be used to identify the areas of concern for the full analysis.

5.3 Pollutants and Sources to be Included in an Application

This section discusses what pollutants and sources should be included in applications for permits to construct (PTCs) and Tier II operating permits. DEQ does have a list of activities that may be treated as "trivial" and which would not need to be included in the permit application. In addition to the activities listed in Table 8, IDAPA 58.01.01.317 list those activities that are "presumptively insignificant emission units." DEQ has determined that these activities must be included in Tier II and PTC applications when facility-wide modeling is required. However, generally they will not be required to be included in the modeling analysis. DEQ recognizes there is some overlap with the list in Table 8 and IDAPA 58.01.01.317. DEQ reserves the right to require the inclusion of any of these activities in the modeling analysis if it is determined they may have a "consequential " effect on the design concentration. Those activities listed in IDAPA 58.01.01.317.b.i must be included in the application. If the applicant does not include them in the modeling analysis, a justification must be supplied that is consistent with the guidance presented in Sections 5.3.0 and 5.3.2 of the State of Idaho Air Quality Modeling Guideline. This list is described in Table 8 below and was taken from an EPA white paper entitled *Streamlined Development of Part 70 Permit Applications* (EPA 1995).

Table 8. Activities That May be Treated as "Trivial"

1. Combustion emissions from propulsion of mobile sources, except for vessel emissions from outer continental shelf sources.
2. Air-conditioning units used for human comfort that do not have applicable requirements under Title VI of the Clean Air Act.
3. Ventilating units used for human comfort that do not exhaust air pollutants into the ambient air from any manufacturing/industrial or commercial process.
4. Noncommercial food preparation.
5. Consumer use of office equipment and products, not including printers or businesses primarily involved in photographic reproduction.
6. Janitorial services and consumer use of janitorial products.
7. Internal combustion engines used for landscaping purposes.
8. Laundry activities, except for dry cleaning and steam boilers.
9. Bathroom/toilet vent emissions.
10. Emergency (backup) electrical generators at residential locations.
11. Tobacco smoking rooms and areas.
12. Blacksmith forges.
13. Plant maintenance and upkeep activities (e.g., grounds keeping, general repairs, cleaning, painting, welding, plumbing, retarring roofs, installing insulation, and paving parking lots) provided these activities are not conducted as part of a manufacturing process, are not related to the source's primary business activity, and not otherwise triggering a permit modification.[a]
14. Repair or maintenance shop activities not related to the source's primary business activity, not including emissions from surface-coating or degreasing (solvent metal cleaning) activities, and not otherwise triggering a permit modification.
15. Portable electrical generators that can be moved by hand from one location to another.[b]
16. Hand-held equipment for buffing, polishing, cutting, drilling, sawing, grinding, turning or machining wood, metal or plastic.
17. Brazing, soldering and welding equipment, and cutting torches related to manufacturing and construction activities that do not result in emission of hazardous air pollutant metals.[c]
18. Air compressors and pneumatically operated equipment, including hand tools.
19. Batteries and battery charging stations, except at battery manufacturing plants.
20. Storage tanks, vessels, and containers holding or storing liquid substances that will not emit any volatile organic compound or hazardous air pollutant.[d]
21. Storage tanks, reservoirs, and pumping and handling equipment of any size containing soaps, vegetable oil, grease, animal fat, and nonvolatile aqueous salt solutions, provided appropriate lids and covers are utilized.
22. Equipment used to mix package soaps, vegetable oil, grease, animal fat, and nonvolatile aqueous salt solutions, provided appropriate lids and covers are utilized.
23. Drop hammers or hydraulic presses for forging or metalworking.
24. Equipment used exclusively to slaughter animals, but not including other equipment at slaughterhouses, such as rendering cookers, boilers, heating plants, incinerators, and electrical power generating equipment.
25. Vents from continuous emissions monitors and other analyzers.

Table 8. Activities That May be Treated as "Trivial"

26. Natural gas, pressure-regulator vents, excluding venting at oil and gas production facilities.
27. Hand-held applicator equipment for hot-melt adhesives with no volatile organic compounds in the adhesive formulation.
28. Equipment used for surface coating, painting, dipping, or spraying operations, except those that will emit volatile organic compound or hazardous air pollutant.
29. Carbon dioxide lasers, used only on metals and other materials that do not emit hazardous air pollutants in the process.
30. Consumer use of paper trimmers/binders.
31. Electric- or steam-heated drying ovens and autoclaves, but not the emissions from the articles or substances being processed in the ovens or autoclaves, or the boilers delivering the steam.
32. Salt baths using nonvolatile salts that do not result in emissions of any regulated air pollutant.
33. Laser trimmers using dust collection to prevent fugitive emissions.
34. Bench-scale, laboratory equipment used for physical or chemical analysis, but not for lab fume hoods or vents.[e]
35. Routine calibration and maintenance of laboratory equipment or other analytical instruments.
36. Equipment used for quality control/assurance or inspection purposes, including sampling equipment used to withdraw materials for analysis.
37. Hydraulic and hydrostatic testing equipment.
38. Environmental chambers not using hazardous air pollutant gasses.
38\. Shock chambers.
40. Humidity chambers.
41. Solar simulators.
42. Fugitive emissions related to movement of passenger vehicles, provided the emissions are not counted for applicability purposes and any required fugitive-dust-control plan or its equivalent is submitted.
43. Process-water filtration systems and demineralizers.
44. Demineralized-water tanks and demineralizer vents.
45. Boiler-water treatment operations, not including cooling towers.
46. Oxygen scavenging (de-aeration) of water.
47. Ozone generators.
48. Fire suppression systems.
49. Emergency road flares.
50. Steam vents and safety relief valves.
51. Steam leaks.
52. Steam cleaning operations.
53. Steam sterilizers.

Table 8. Activities That May be Treated as "Trivial"

Source: EPA 1995.

a. Cleaning and painting activities qualify if they are not subject to volatile organic compound or hazardous air pollutant control requirements. Asphalt batch plant owners/operators must still get a permit if otherwise required.
b. "Moved by hand" means the generator can be moved without the assistance of any motorized or nonmotorized vehicle, conveyance, or device.
c. Brazing, soldering and welding equipment, and cutting torches related to manufacturing and construction activities that emit hazardous air pollutant metals are more appropriate for treatment as insignificant activities based on size or production-level thresholds. Brazing, soldering, welding, and cutting torches directly related to plant maintenance, upkeep, and repair, or maintenance shop activities that emit hazardous air pollutant metals, are treated as trivial.
d. Exemptions for storage tanks containing petroleum liquids or other volatile organic liquids should be based on size limits such as storage tank capacity and vapor pressure of liquids stored and are not appropriate for this list.
e. Many lab fume hoods or vents might qualify for treatment as insignificant (depending on the applicable State Implementation Plan) or can be grouped together for purposes of description.

5.3.1 Permits to Construct

For PTC applications, all increases in emissions of criteria pollutants are generally required to be accounted for in the PA. All TAPs, except those exempted under IDAPA 58.01.01.210.20, with emissions increases above the DEQ TAP ELs (discussed in Section 3.0) must be included in the modeling analysis. Generally, modeling is required for all sources determined not to be fugitive emissions. Fugitive emissions are not normally modeled in air impact analyses for minor source applications. Fugitive emissions are defined in IDAPA 58.01.01.006.43 as, "those emissions which could not reasonably pass through a stack, chimney, vent, or other functionally equivalent opening." This definition includes windblown dust from a stockpile. However, the definition generally does not apply to fugitive emissions that are not directly related to the facility (e.g., windblown dust from a field).

Examples of fugitive emissions are dust from roadways, transfer points (e.g., dumping a front-end loader), and conveyor belts. Emissions that pass through a stack or control device and are vented back into a building are not considered fugitive emissions. These emissions must be estimated and included in the modeling analysis. Facilities may be required to model fugitive emissions if DEQ determines it necessary to protect ambient air quality standards.

The applicant may determine that some sources are "inconsequential" when estimating the design concentration (i.e., only contribute to a small percentage of the total, maximum, ambient impact for that project) and exclude them from the modeling analysis. If this is the case, the applicant must justify the exclusion of these sources. This justification, which is pollutant and averaging-period specific, must be based on emissions rates and a qualitative discussion of impacts. For example, if an emissions unit operates 24 hours per day but only 500 hours per year, the source may be "inconsequential" for the annual emissions, but not for the 24-hour emissions. The justification should include the following two phases:

1. Compare the uncontrolled emissions and operating conditions of each emissions source to the total emissions that would be modeled. If the uncontrolled emissions are "small" compared to the total emissions and are not expected to impact the maximum ambient concentration, the individual emissions source may be deemed as "inconsequential" and may be excluded from the modeling analysis. If controlled emissions are used in this analysis, those controls must be federally enforceable.

2. If more than one emissions source is excluded from the modeling analysis, the total uncontrolled emissions of those sources excluded and the total estimated ambient concentration must be compared to the total emissions. This will ensure that all of the excluded sources are still "inconsequential" as a whole.

Facilities located in an NAA for a specified pollutant are required to model all the emissions for that specified pollutant, even those emissions that are deemed to be inconsequential. This process will be treated on a case-by-case basis. It is recommended that the applicant meet with DEQ staff prior to beginning the modeling analysis to discuss what sources will be included.

5.3.2 Tier II Operating Permits

The purpose of Tier II operating permits is to evaluate and document the requirements for all the sources of air pollutants from a facility. All emissions, both criteria pollutants and TAPs, for the entire facility, excluding those listed in Table 8, are required to be included in a Tier II application. All criteria pollutant emissions are generally required to be included in the modeling analysis submitted with the Tier II operating permit application. Facility-wide TAP emissions are not required to be included in the modeling analysis for the Tier II application. DEQ reserves the right to request additional information or analysis, including the modeling of other pollutants, under IDAPA 58.01.01.402.04, if there is a concern relative to compliance with IDAPA 58.01.01.161. Modeling of fugitive emissions may be required if DEQ determines it necessary to protect ambient air quality standards.

As with the PTC application, the applicant may determine that some criteria pollutant sources are "inconsequential" when estimating the design concentration (i.e., only contribute to a small percentage of the total, maximum, ambient impact for that project) and exclude them from the modeling analysis. The applicant should use the process presented above in Section 5.3.1. Facilities located in an NAA areas for a specified pollutant must contact the DEQ modeling coordinator at (208) 373-0502 prior to submitting the Tier II application. DEQ modeling staff will review the current SIP for the area to determine the appropriate level of analysis. This process will be treated on a case-by-case basis. It is recommended that the applicant meet with DEQ staff prior to beginning the modeling analysis to discuss what sources will be included.

5.4 Source Information Required

This section discusses the information about the source that is required for an ambient air assessment.

5.4.1 Emission Rates

Tables 9.1 and 9.2 in the *Guideline on Air Quality Models* (EPA 2001) present the emission information required for air dispersion modeling. The emission rate used in the modeling analysis must be the maximum design capacity or a federally enforceable permit condition (40 CFR 51, Appendix W, Table 9-2). For a modified source, the emission rate to be modeled for criteria pollutants is the net emission rate increase in a PA, as defined in IDAPA 58.01.01.007.06. The emission rate increase is based on actual emissions. These actual emissions are based on the previous two years of operation (or as approved by DEQ) and the requested emission rate. All criteria pollutants that have net emission rate increases that exceed the modeling thresholds must be modeled. For PTCs, the emission rate increase of TAPs is compared to the EL in IDAPA 58.01.01.585 and .586. Any TAP that has an emission increase that exceeds the EL must be modeled. When an FIA is required, the potential emissions for all sources and, if required, any co-contributing sources are used in the modeling analysis.

The maximum emission rate for each averaging period must be identified. For example, PM_{10} has both a 24-hour and an annual standard. If a source will only operate 7,000 hours per year but can operate for 24 hours in a single 24-hour period, then different emission rates would be modeled for the 24-hour standard and annual standard

5.4.2 Source Parameters

According to Section 9.1.2(c) in the *Guideline on Air Quality Models* (EPA 2001), the stack parameters for each point source that are required for modeling are as follows:

- Stack base elevation (feet or meters)
- Stack height (feet or meters)
- Stack inside diameter (feet or meters) (If the stack is not circular, use equivalent dimensions determined by Area = $d^2\pi/4$, where d is the stack's inner diameter)
- Stack exit velocity (meters/second) or exit flow rate (actual cubic feet per minute (acfm))
- Stack exit temperature (°F or K)

Source parameters for area sources include the following:

- Source height (meters)
- Easterly dimension (meters)
- Northerly dimension (meters)
- Initial vertical dimension (meters)
- Angle from North (degrees)

Source parameters for volume sources include the following:

- Source height (meters)
- Initial horizontal dimension (meters)
- Initial vertical dimension (meters)

DEQ also requires the following be included in the application and modeling analysis:

- Orientation of the stack (horizontal or vertical)
- Presence of rain cap or other obstruction

These additional requirements are important because they affect the dispersion characteristics of the pollutants. If either a horizontal stack or rain cap (or other obstruction) is present, it must be accounted for in the modeling analysis. This is to account for the fact that upward momentum is zero because of either the obstruction or the orientation of the stack.

Some permit applicants and consultants have proposed to model these sources as elevated volume sources when using ISCST3 and when the emitted plume is nonbuoyant. DEQ has researched and evaluated the use of volume sources for horizontal releases and has concluded that DEQ will not typically approve modeling analyses that utilize this method. This conclusion was based on the following:

- By using this method, building downwash effects cannot be considered in the analysis. Consideration of these effects are often crucial for obtaining reasonably accurate results.
- There is a well-established method to account for these sources while still enabling building downwash effects to be considered.

The method recommended by DEQ is based on a procedures recommended by EPA (July 9, 1993, memorandum from Joseph A. Tikvart, Source Receptor Analysis Branch, to Ken Eng, Chief, Air Compliance Branch, Region II). The method involves setting the stack velocity to 0.001 meters per second to effectively turn off momentum plume rise. The memo also states:

> "For horizontal stacks that are not capped, we suggest turning stack tip downwash off, whether there are buildings or not. Stack tip downwash calculations are inappropriate for horizontal stacks."

> "For vertical stacks that are capped, turn stack tip downwash off and reduce the stack height by three times the actual stack diameter. The cap will probably force stack tip downwash most of the time. The maximum amount of the stack tip downwash (as calculated by ISC2) is three times the stack diameter."

DEQ assessment of this approach revealed that when the stack velocity is set to 0.001 meters per second, the stack tip downwash is automatically set to the maximum of three times the stack diameter. The stack tip downwash equation in ISCST3 for effective stack height is $h' = h + 2d(v/u – 1.5)$ when the wind speed at stack height (u) is greater than v/1.5 (v is the stack gas velocity). When the wind speed at stack height is less than or equal to v/1.5, then $h' = h$. If v is fixed at 0.001, then the equation $h' = h$ would only be used for wind speeds less than 0.0007 meters per second. Because ISCST3 only models wind speeds equal to or greater than 1.0 meters per second, the first equation for stack tip downwash effects would always be used (the wind speed would never be below 0.0007 meters per second). By the first equation ($h1 = h + 2d(v/u – 1.5)$), stack tip downwash is greater for low wind speeds. For $u \geq 1$ meters/second and $v = 0.001$, $v/u = 0.001$, and the equation simplifies to $h' = h – 3d$ (independent of u).

The recommended method for modeling point sources of nonbuoyant emissions with horizontal release or vertical release with the presence of a rain cap is as follows:

1) Define the emission source as a point source, entering in the model the actual height of release, stack gas temperature, and the Universal Transverse Mercator (UTM) coordinates.

2) Plumes from horizontal emission releases or vertical stacks with rain caps experience no momentum induced plume rise. Set the stack gas exit velocity to 0.001 meters per second to effectively prevent ISCST3 from accounting for momentum plume rise.

3) Stack tip downwash is not appropriate for horizontally released emissions. If the emissions vent in the horizontal direction, the stack diameter can be set to 0.001

meters to prevent stack tip downwash effects. This step should not be used for sources that vent vertically with a rain cap over the stack, since the rain cap will not prevent stack tip downwash effects. The actual inside stack diameter should be used for rain-capped stacks.

4) Run the model as otherwise required.

By altering the stack gas-flow velocity, emission quantities are not affected. The ISCST3 model only uses flow velocity, stack temperature, stack diameter, and other stack parameters to evaluate effects such as building downwash, plume rise, and stack tip downwash. ISCST3 only models emissions on a mass-per-unit-time basis, it does not consider the concentration of a pollutant within the stack gas. Therefore, altering the exit velocity can only affect the calculation of plume rise and stack tip downwash; it will not affect the modeled concentrations in any other way.

Alternate methods may be approved by DEQ on a case-by-case basis if there are unique circumstances. In such cases, DEQ strongly advises that the permit applicant or consultant contact DEQ prior to modeling to discuss the issue, prepare a modeling protocol, and obtain prior approval from DEQ to use the proposed method.

5.4.3 Scaled Plot Plan

A scaled plot plan showing emission release locations, nearby buildings, property lines, fence lines, and roads is required (Section 9.1.2(b), *Guideline on Air Quality Models* (EPA 2001)). The dimensions of the buildings (height, width, and length) should be noted either on the plot plan or in a table in the report. If building dimensions are listed in a table format, then it should be easy to cross-reference between the plot plan, model input file, and table.

5.4.4 Building Downwash Parameters

According to Section 7.2.5 in the *Guideline on Air Quality Models* (EPA 2001), the air quality impacts associated with cavity and wake effects due to the nearby building structures should be determined for any stacks with less than good engineering practice (GEP) stack heights. If SCREEN3 is used, the building with the greatest corresponding GEP stack height should be analyzed. This may not necessarily be the building closest to the stack. When the EPA's ISCST3 model is used and stacks are less than GEP stack height, building profile information is required for use in the modeling. The recommended building profile software is the EPA's *Building Profile Input Program* (BPIP). This program can also be used to determine which building should be used in the screening analysis. If ambient air, see Section 5.5 for a description, is determined to be in the cavity of the building (i.e., right next to the building with the stack), then SCREEN3 is the only model approved for use. The ISCST3 model does not calculate concentrations in the cavity region. Therefore, ISCST3 is not approved for use in the cavity region of the building.

5.5 Ambient Air Boundary

The ambient air boundary must be determined before an ambient air assessment can be completed. The definition of ambient air in IDAPA 58.01.01.006.09 is, "that portion of the atmosphere, external to buildings, to which the general public has access." The EPA has further stated that "the exemption from ambient air is available only for the atmosphere over land owned or controlled by the source and to which public access is precluded by a fence or other physical barriers" (Costle 1980). Based on these definitions, DEQ has developed the following guidance to be used when determining the ambient air boundary for a facility.

It shall be assumed that the air within the facility boundaries is ambient air unless the facility can demonstrate that public access is precluded. The facility-proposed, ambient air boundary must include justification that demonstrates the facility has reasonable control of the area and effectively precludes public access on a routine basis. The following criteria must be satisfied when developing a facility-proposed, ambient-air boundary justification. A justification must accompany the answers.

1. Facility Control

   a) Is general public access precluded by a physical barrier (e.g., fence with a gate)? If yes, the facility is assumed to be controlled public access effectively precluded, and the ambient air boundary can be set at the fence line. Proceed to No. 2. If no, then proceed to No. 1b.

   b) Is general public access discouraged by the type of area (e.g., industrial park site away from residential or recreational areas), size of the facility (e.g., the facility is surrounded by a buffer zone that is controlled by the facility), or a remote location away from the proximity of human habitation or activities? Is the facility controlled by reasonable posting of the property with "no trespassing" signs, or reasonable patrol of the property by a security person who routinely asks trespassers to leave? If yes to **BOTH** questions, the facility is assumed to be controlled, public access effectively precluded, and the ambient air boundary is determined to be at the property boundary. Proceed to No. 2. If no, to **EITHER** question, proceed to No. 1c.

   c) If the facility is not controlled by a physical barrier **AND/OR** general public access is not discouraged by the type of area, size of the facility, or the remoteness of the facility location, then the ambient air boundary is determined to be inside the property boundary. The actual point at which the ambient air boundary occurs is dependent on several factors, such as the type of operation at the facility (e.g., are employees outside on a regular basis?) and whether employees have a clear view, from the location where the employees normally work, of the entire property (e.g., are trees blocking the sight?). The ambient air boundary is determined to be at a point where employees are not regularly present and where they do not have a clear view of the property. To meet this criteria, a very detailed description of the facility and property must be provided. If a justification cannot be provided, the ambient air boundary is determined to be all air that is external to the buildings. Proceed to No. 2.

2. Facility Business

   Is the general public invited as part of the normal business conducted on the facility site (e.g., the facility includes a commercial establishment or service provider)? If yes, then the area in which the public is invited is determined to be ambient air. Adjust the ambient air boundary determined in No. 1. If no, the ambient air boundary determined in No. 1 is not changed. Proceed to No. 3.

3. Right-of-Way Access

   Is the general public allowed on site as a part of a right-of-way easement or a common service road? If yes, then the right-of-way is determined to be ambient air. Adjust the ambient air boundary determined in No. 1. If no, the ambient air boundary determined in No. 1 is not changed.

Any area outside the facility's (or facilities' if they are under common ownership) control will be considered ambient air. This includes other industrial facilities. The employees of other facilities are determined to be general public for the facility in question. Evaluation of the ambient air quality must include all sources within facility control if the source or source modification exceeds the SCLs defined in IDAPA 58.01.01.006.93.

5.6 Receptor Network

The purpose of the receptor network is to set locations where the air dispersion model calculates an ambient concentration. Receptors are required to be placed in the ambient air. Cartesian (gridded) receptors are preferred over polar receptors. This is due to the fact that with polar receptors the receptor spacing becomes too wide as distance increases from the source. Therefore, polar receptors will generally not be approved for use in a refined modeling analysis. Receptor spacing should be as follows:

- Coarse grid receptors spaced between 100 and 500 meters apart
- Fine grid receptors spaced between 50 and 100 meters apart in the area of maximum concentration
- Ambient air boundary receptors spaced between 25 and 50 meters apart
- Receptors in steep terrain spaced between 25 and 50 meters apart

Any deviation from these recommendations must be justified.

An efficient way to set up the receptor grid for refined modeling is to run SCREEN3 to establish the general distance to the maximum ambient concentration. An alternative is to surround the facility with receptors starting at the ambient air boundary. Initial refined modeling simulations typically begin with a fairly coarse grid. If the maximum ambient concentrations are occurring at the edge of the grid, the grid will need to be adjusted until the maximum is within the grid.

This process can become complicated in complex terrain because vertical variations, especially at heights near the plume centerline, can have a significant effect on predicted concentrations.

After the general location of the maximum ambient concentration is identified, a finer grid (with spacing of 50 to 100 meters) must be used in the final model runs. As with the coarse grid, if the maximum occurs on the edge of the grid, the absolute maximum has probably not been established; the grid will have to be moved until the maximum is within the grid. The applicant is responsible for defending his/her interpretation of the maximum predicted impact. It is suggested that the process of locating and quantifying the predicted maximum be described in the text accompanying the application.

5.7 Elevation Data

Terrain elevations for sources and receptors should be used when appropriate (EPA 2001). U.S. Geological Survey (USGS) Digital Elevation Model (DEM) data may be used in most areas, although it may be necessary to pick elevations for discrete receptors in nearby complex terrain using better resolution data. For nearby receptors, using 7.5-minute USGS DEM data is required. The 7.5-minute DEM files are digital representations of cartographic information in a raster form. The DEMs consist of a sampled array of elevations for a number of ground positions at regularly spaced intervals. Each 7.5-minute DEM is based on 30 - by - 30 meter data spacing with the UTM projection. Each block provides the same coverage as the standard USGS 7.5-minute map series. It is usually best to extract elevations for sources and receptors from the same database to avoid discontinuities.

5.8 Meteorological Data

The meteorological data used in the modeling analysis should be representative of the meteorological conditions at the particular site of the proposed construction or modification. According to Section 9.3 in the *Guideline on Air Quality Models* (EPA 2001), the representativeness of the meteorological data is dependent on the following: (1) the distance from the meteorological monitoring site to the area under consideration; (2) the complexity of the terrain surrounding both the meteorological monitoring site and the area under consideration; (3) the exposure of the meteorological monitoring site; and (4) the period of time during which data is collected. Consult with the DEQ air quality modeling coordinator to determine if representative meteorological data is available for the area under consideration. If no representative meteorological data is available, then site-specific data should be acquired by the facility. Generally, site-specific meteorological data is only required for PSD applications or when DEQ has concern regarding NAAQS compliance. The collection of site-specific meteorological data should follow the recommendations provided in *Meteorological Monitoring Guidance for Regulatory Modeling Applications* (EPA 2000), as well as Section 9.3.3 in the *Guideline on Air Quality Models* (EPA 2001). Site-specific meteorological data must be approved prior to use in a modeling analysis. Generally, EPA recommendations and procedures are determined to be adequate for DEQ approval. To receive approval, the facility must provide DEQ staff with standard operating procedures, or the quality assurance plan for operating the meteorological tower, and quality control audit reports that cover the entire year of data. DEQ will review this information and respond with either an approval or denial letter. The facility should either reference or include a copy of the approval letter when this meteorological data is used in a modeling analysis. This will help to expedite the review process of the permit application. It is recommended that the facility contact a DEQ modeler if a refined model will be run in screening mode. In this case, the output will be a 1-hour concentration. The persistence factors are appropriate for converting the 1-hour concentration to the appropriate averaging period. DEQ does not recommend using a refined model in screening mode when complex terrain is an issue.

There are several sources of meteorological data besides that which might be collected on site. The National Weather Service (NWS) collects data throughout the country. Most of this data is collected at airports. It is available through the National Climatic Data Center [(704) 259-0682], through EPA's SCRAM Web site, or possibly through DEQ's modeling coordinator.

As stated in Section 9.3.1.1 in the *Guideline on Air Quality Models* (EPA 2001), the model user should "acquire enough meteorological data to ensure that worst-case meteorological conditions are adequately represented in the model results." Section 9.3.1.2 recommends using five years of NWS data or at least one year of site-specific data. If more than one year of site-specific data is available, then all years, up to five years, should be used (see Section 9.3.1.2(b) in EPA 2001). Site-specific meteorological data must be subjected to quality assurance procedures.

5.9 Land-Use Classification

Determining if the area surrounding the facility is urban or rural is necessary before a dispersion modeling analysis can be conducted correctly. Two methods of classifying an area as urban or rural are described in Section 8.2.8 in the *Guideline on Air Quality Models* (EPA 2001). The first is the land-use method. The area is classified according to the current land usage (according to the meteorological land-use typing scheme proposed by Auer [1978]) of its surroundings in a three-kilometer (approximately 1.8-mile) radius centered at the source. If 50 percent or more of the surrounding area is classified as I1, I2, C1, R2, or R3 (using classifications listed in Auer 1978), the source would be considered an urban source. Otherwise, the source would be considered rural. Appendix E provides a summary of the meteorological land use typing scheme proposed by Auer (1978).

A second method relies on population density. If the population density within a three-kilometer (approximately 1.8-mile) radius, centered at the facility, is greater than 750 people per square kilometer, the urban modeling option for the area can be used. However, the population density method of source classification should not be applied to highly industrialized areas. This is because highly industrialized areas typically have low population densities, but the presence of buildings and areas of asphalt and concrete make the source more urban in nature. The *Guideline on Air Quality Models*, Section 8.2.8, states that, of the two methods, the land use procedure is more definitive (EPA 2001).

5.10 Background Concentrations

Section 9.2 in the *Guideline on Air Quality Models* (EPA 2001) discusses the use of background concentrations in a NAAQS analysis. Background concentrations of regulated criteria pollutants must be included in NAAQS analyses for both PSD and non-PSD applications. The modeler is required to contact DEQ prior to beginning the modeling analysis to obtain the appropriate background concentration(s) for the area. A different concentration is needed for each averaging period, for each pollutant. Background concentrations are developed based on air quality monitoring data. If the facility under consideration is found to impact the ambient air quality monitor that is used to determine the background concentration, it is the facility's responsibility to assess their contribution to the background concentration. Prior to this assessment, a protocol must be submitted to, and approved by, DEQ. The assessment must then be done in accordance with the DEQ-approved protocol.

5.11 Evaluation of Compliance with Standards

The applicant must demonstrate compliance with all other applicable impact limits in addition to demonstrating compliance with NAAQS. For PSD applications, these include impact limits for Class I areas within 200 kilometers, NAA impact limits (when in or potentially significantly impacting a NAA), and TAP standards (when emitting TAP above DEQ ELs). Federal land managers have the responsibility to protect the natural and cultural resources of Class I areas from adverse impacts of air pollution. Refer to the *Federal Land Managers Air Quality Related Values Workgroup (FLAG) Phase I Report* (USFS et al 2000). In some cases (e.g., radionuclides or fluorides, for example), deposition of airborne pollutants or human risk pathways associated with deposition of airborne emissions may be subject to regulatory impact limits.

The highest ambient concentration must be used for comparison against the SCLs for all applicable criteria pollutants.

The following design concentrations must be used when demonstrating compliance with the NAAQS and PSD increment:

- NO_2
  - Annual averaging period – highest ambient concentration
- SO_2
  - 3-hour averaging period – highest, second highest ambient concentration
  - 24-hour averaging period – highest, second highest ambient concentration
  - Annual averaging period – highest ambient concentration
- CO
  - 1-hour averaging period – highest, second highest ambient concentration
  - 8-hour averaging period – highest, second highest ambient concentration
- Pb
  - Quarterly averaging period – highest ambient concentration

- PM_{10}
  - 24-hour averaging period (NAAQS only) – "the projected 24-hour average concentrations will not exceed the 24-hour NAAQS more than once per year on average" (EPA 2001). The design concentration is dependent on the number of meteorological data years used in the analysis. For example, if five years of NWS data were used, then the design concentration would be the sixth highest 24-hour ambient concentration that occurred at each receptor over that five-year period.
  - 24-hour averaging period (PSD increment) – highest, second highest ambient concentration
  - Annual averaging period – highest ambient concentration

The following design concentrations must be used when demonstrating compliance with the TAP requirements:

- Noncarcinogens – 24-hour averaging period – highest ambient concentration
- Carcinogens – annual averaging period – highest ambient concentration

5.12 Air Quality Modeling Report

The facility modeler must supply an air quality modeling report that presents the case as to why the permit should be issued. The level of detail of the report will depend on the complexity of the proposed facility and the situations in question.

Below is an example annotated outline of an air quality modeling report.

I Purpose

- State what the air quality modeling analysis is for (i.e., demonstrating compliance for a permit to construct or a Tier II operating permit).

II Model Description/Justification

- Discuss what model was chosen and justify why it is the appropriate model for the situation.

III Emission and Source Data

- Present tables showing the current (actual) emission rates, future allowable emission rates (maximum short-term and long-term), and the requested emission increase (future allowable minus actual).

- Provide justification for those sources and/or pollutants determined to be "inconsequential" (if applicable).

- Provide stack parameters (emission rates, stack height, stack elevation, stack diameter, stack gas exit velocity, and stack gas exit temperature) for each new or modified emission point.

- Provide parameters for area and volume sources such as source dimensions and release heights. Include a justification for the source type chosen.

- Provide similar information for existing sources at the facility upon request by DEQ if a full impact analysis is required.

- Provide a facility plot plan to scale showing the fence line, ambient air boundary, emission sources at the facility, and buildings. Include the height, width, and base elevation of each building at the facility.

- Provide sufficient information in the permit application so DEQ can compute a UTM coordinate for the source(s). For example, provide the street address of the facility.

IV Receptor Network

- Describe the receptor network used. Include the distance between receptors for the fine and course grids. Include a discussion about ambient air. Justify any deviation from recommendations in EPA or state guidelines.

V Elevation Data

- Describe if elevation data was used and the source of the information. If necessary, include a USGS 7.5-minute map showing the location of the facility. A justification must be provided if elevation data is not used.

VI Meteorological Data

- Describe the source of the data and present a representative analysis according to Section 5.8. Electronic copies of the files must be included with the modeling report if meteorological data from sources other than the NWS are used. If site-specific data is used, provide documentation that DEQ has reviewed and approved the data.

VII Land-Use Classification

- State the land-use classification for the area surrounding the source and provide the justification.

VIII Background Concentrations

- State if background concentrations were used and identify the source of the information.

IX Evaluation of Compliance with Standards

- Include tables summarizing the air quality model output (example tables are shown in Appendix F).

X Electronic Copies of the Modeling Files

- Provide modeling input/output files (including BPIP input and meteorological data if other than NWS data is used) on diskette, compact disk, or other means.

6.0 Summary

This document provides guidance for performing an ambient air assessment, for permitting purposes, in the state of Idaho. This document should be used in conjunction with the EPA's *Guideline on Air Quality Models* (EPA 2001) and *New Source Review Workshop Manual* (EPA 1990). Following the guidance in this document, as well as EPA guidance, will help expedite DEQ's review of the application.

7.0 References

40 CFR 52.21, *Prevention of Significant Deterioration of Air Quality.*

Auer, A.H., Jr., 1978. *Correlation of Land Use and Cover with Meteorological Anomalies*. Journal of Applied Meteorology, 17(5): 636-643.

Costle, Douglas, M., 1980. *Correspondence to Senator Jennings Randolph*. December 19, 1980.

EPA, 1990. *New Source Review Workshop Manual, Prevention of Significant Deterioration and Nonattainment Area Permitting*. New Source Review Section, Noncriteria Pollutants Program Branch, Air Quality Management Division, U.S. Environmental Protection Agency, Research Triangle Park, NC.

EPA, 1992. *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised*. EPA Publication No. EPA-454/R-92-019. U.S. Environmental Protection Agency, Research Triangle Park, NC.

EPA, 1995. *Streamlined Development of Part 70 Permit Applications*. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards.

EPA, 2000. *Meteorological Monitoring Guidance for Regulatory Modeling Applications*. EPA Publication No. EPA-454/R-99-005. U.S. Environmental Protection Agency, Research Triangle Park, NC.

EPA, 2001. *Guideline on Air Quality Models*. 40 CFR Part 51, Appendix W, July 1, 2001.

EPA's SCRAM Web site: http://www.epa.gov/scram001/index.htm

IDAPA 58.01.01, et seq. *Rules for the Control of Air Pollution in Idaho*

Appendix A - Persistence Factors For Use With SCREEN3

Persistence Factors for Use with SCREEN3

The SCREEN3 output is for a one-hour average only. This one-hour average concentration must be adjusted to estimate the concentration for the appropriate averaging period. SCREEN3 users convert one-hour-average model output to averaging periods consistent with the standard for the pollutant modeled through the use of persistence factors.

Converting One-Hour Output to Averaging Periods Consistent with the Standard for the Pollutant Being Modeled

DEQ accepts the following persistence factors to convert SCREEN3 outputs to other averaging periods:

Averaging Period	Simple Terrain	Complex Terrain
3-hour	0.9	0.7
8-hour	0.7	
24-hour	0.4	0.15
Quarterly	0.13	
Annual	0.08 (for criteria pollutants) 0.125 (for carcinogenic TAPs, per IDAPA 58.01.01.210.03.a.i)	0.03 (for criteria pollutants) 0.125 (for carcinogenic TAPs, per IDAPA 58.01.01.210.03.a.i)

Please contact a DEQ modeler if a conversion factor is needed for any other averaging period.

Appendix B - NAA Status and Class I Areas

NAA Status and Class I Areas

This appendix shows the NAAs and Class I areas in and near Idaho. The areas represent situations where air quality impact limits are stricter than the NAAQS. The information in this appendix is current as of the date of this document. Please check with DEQ to verify if it is still current. Figure B-1 shows the NAAs in Idaho.

Area Classifications

The Class I, II, and III areas are defined below (shown in Figure 2).

1. Class I - National park, recreation, and wilderness areas established when the 1977 Clean Air Act was passed, and other designated parts of the country that now benefit from high quality air and where a high priority has been established for the maintenance of pristine conditions. Additional degradation of the air is severely restricted.

2. Class II - Areas that need reasonably or moderately good air quality protection. This is presently the class designation of most areas in the United States. Increments of deterioration have been stipulated that will generally accommodate most proposed development projects.

3. Class III - Areas that can, at the discretion of the states, be designated as allowing for larger increments of air quality degradation and therefore greater growth and development potential. No Class III areas have been designated in Idaho.

The Class I areas in Idaho include the following: Hells Canyon, Sawtooth, and Selway-Bitterroot wilderness areas, Craters of the Moon National Monument, and Yellowstone National Park.

Class I areas near Idaho's borders include the following: Spokane Indian Reservation, Washington; Hells Canyon and Eagle Cap Wilderness areas, Oregon; Cabinet Mountain and Anaconda-Pintler Wilderness areas, Red Rock Lakes, and Flathead Indian Reservation, Montana; Yellowstone National Park, Montana and Wyoming; Teton National Park, Wyoming; and Jarbidge Wilderness, Nevada.

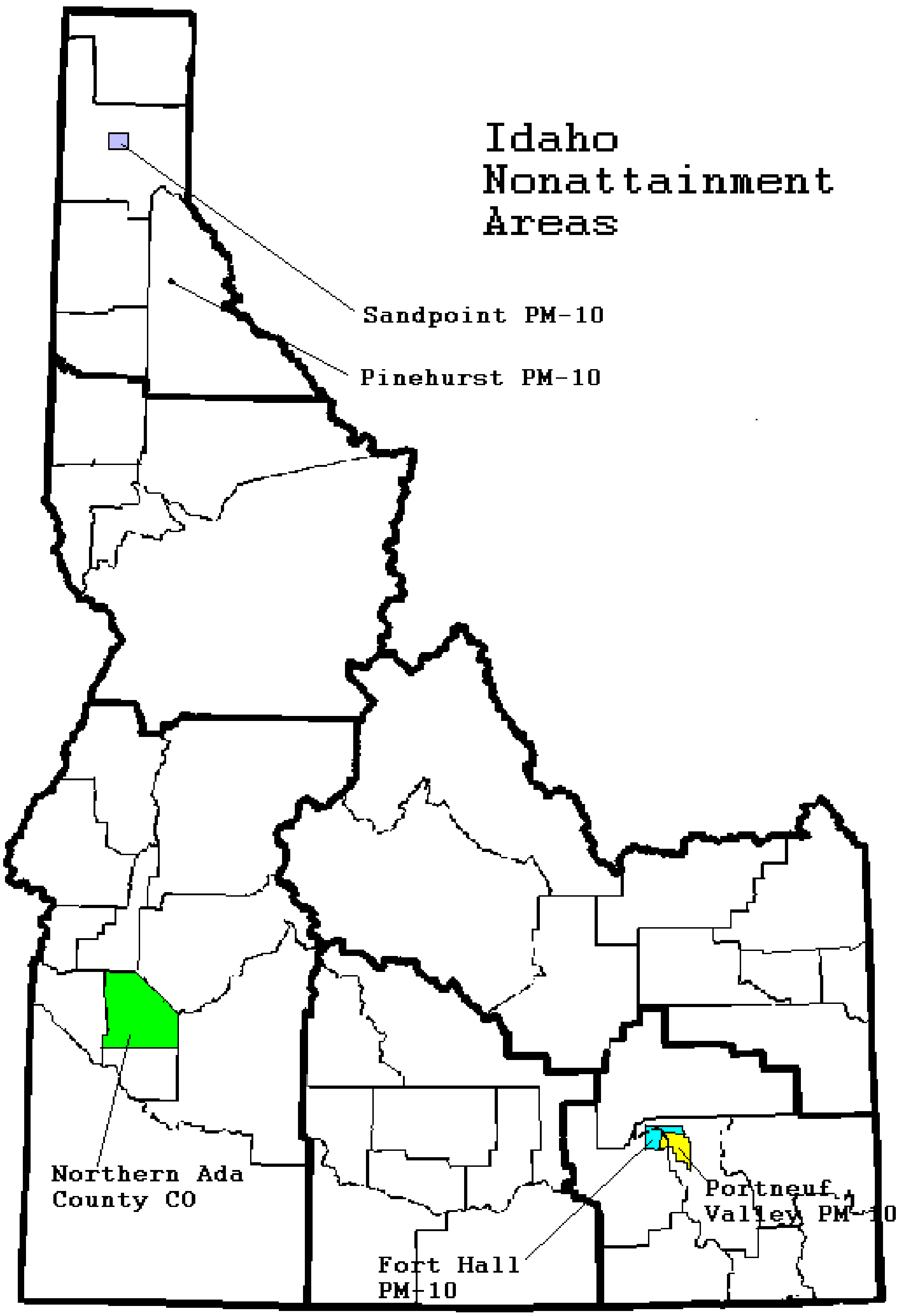

Figure B-1. NAAs in Idaho

(Northern Ada County currently has no EPA/Idaho designation. The procedure is to treat it as a PM_{10} NAA for major sources).

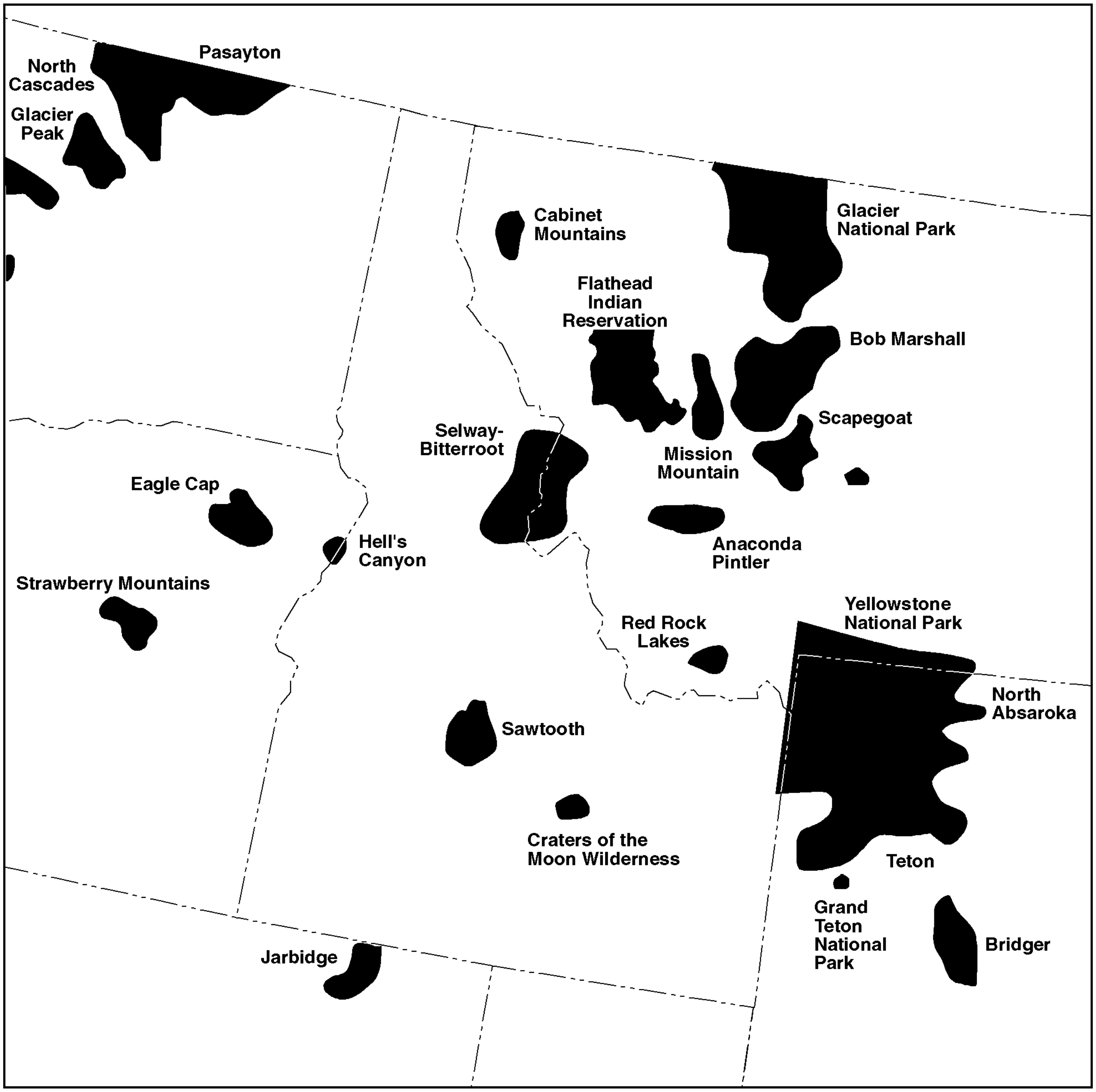

Figure B-2. Class I areas in and near Idaho.

Appendix C - Idaho DEQ Air Dispersion Modeling Checklist

Idaho DEQ Air Dispersion Modeling Checklist

As a requirement of the air permitting process, an air dispersion modeling analysis (screening and/or refined) must be conducted. Air dispersion models are used to predict the potential impact a source may have on the air shed in which it is located. This checklist will aid in collecting all of the necessary information to perform a complete modeling analysis. The EPA's *Guideline on Air Quality Models* (EPA 2001) and this guideline should be used as a reference to ensure that the modeling techniques used will meet federal and state requirements. Please include sufficient computer disk copies of the DOS versions of input and output files so DEQ can reproduce model runs. DEQ must be able to rerun the input files on the DOS versions of the models. Copies of the meteorological data files used and all building information must also be included. A scaled plot plan showing the location of all structures and emission points needs to be submitted as part of the permitting application. It is strongly recommended that the facility contact the DEQ modeling coordinator prior to performing an air quality assessment to negotiate a modeling protocol. Units must be noted where appropriate, both English and metric units are acceptable.

It is important that the **most recent model versions** be utilized in any analysis.

1. Name of Applicant/Company:

   Facility Description:

   Dispersion Model(s) Used:

2. Source Classification:

   Number of Point Sources ____________
   (Section 3)

   Number of Area Sources ____________
   (Section 4)

   Number of Volume Sources ____________
   (Section 5)

3. Stack/Point Source Parameters (please include for each stack/point source modeled). List the **maximum** emissions rate(s) for each pollutant. NOTE: If the stack is not circular, use equivalent dimensions determined by AREA = $\pi d^2/4$, where d is the inner stack diameter. Units must be noted where appropriate, both English and metric units are acceptable. (Note: $PM_{2.5}$ refers to particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers)

Source________________________

PM_{10}__________ $PM_{2.5}$ __________ NO_x __________ SO_2 __________ CO__________ VOC __________________

Toxic(s) (Please List):____

Stack Height___________________ Stack Diameter________________ Stack Temperature_____________________

Stack Exit Velocity____________________________ and/or Actual Stack Flow Rate__________________________

Stack Orientation (Horizontal or Vertical)_________________Rain Cap Present (Y or N)_______________

Source________________________

PM_{10}__________ $PM_{2.5}$ __________ NO_x __________ SO_2 __________ CO__________ VOC __________________

Toxic(s) (Please List):____

Stack Height___________________ Stack Diameter________________ Stack Temperature_____________________

Stack Exit Velocity____________________________ and/or Actual Stack Flow Rate__________________________

Stack Orientation (Horizontal or Vertical)_________________ Rain Cap Present (Y or N)______________________

Source________________________

PM_{10}__________ $PM_{2.5}$ __________ NO_x __________ SO_2 __________ CO__________ VOC __________________

Toxic(s) (Please List):____

Stack Height___________________ Stack Diameter________________ Stack Temperature_____________________

Stack Exit Velocity____________________________ and/or Actual Stack Flow Rate__________________________

Stack Orientation (Horizontal or Vertical)________________________Rain Cap Present (Y or N)_______________

4. Area Source Parameters (please include for each area source modeled). List the **maximum** emissions rate(s) for each pollutant. Units must be noted where appropriate, both English and metric units are acceptable.

Source________________

PM_{10} __________ $PM_{2.5}$ __________ NO_x __________ SO_2 __________ CO__________ VOC ________________

Toxic(s) (Please List):____

Source Height __________ Easterly Dimension ____________________ Northerly Dimension __________________

Initial Vertical Dimension ______________________________ Angle from North ______________________

Source________________

PM_{10} __________ $PM_{2.5}$ __________ NO_x __________ SO_2 __________ CO__________ VOC ________________

Toxic(s) (Please List):____

Source Height __________ Easterly Dimension ____________________ Northerly Dimension __________________

Initial Vertical Dimension ______________________________ Angle from North ______________________

Source________________

PM_{10} __________ $PM_{2.5}$ __________ NO_x __________ SO_2 __________ CO__________ VOC ________________

Toxic(s) (Please List):____

Source Height __________ Easterly Dimension ____________________ Northerly Dimension __________________

Initial Vertical Dimension ______________________________ Angle from North ______________________

Source________________

PM_{10} __________ $PM_{2.5}$ __________ NO_x __________ SO_2 __________ CO__________ VOC ________________

Toxic(s) (Please List):____

Source Height __________ Easterly Dimension ____________________ Northerly Dimension __________________

Initial Vertical Dimension ______________________________ Angle from North ______________________

5. Volume Source Parameters (please include for each volume source modeled). List the **maximum** emissions rate(s) for each pollutant. Units must be noted where appropriate, both English and metric units are acceptable.

Source ________________

PM_{10} __________ $PM_{2.5}$ _________ NO_x __________ SO_2 __________ CO___________VOC _________________

Toxic(s) (Please List):____

Source Height ________________________ Initial Horizontal Dimension ___________________________

Initial Vertical Dimension ____________________________________

Source ________________

PM_{10} __________ $PM_{2.5}$ _________ NO_x __________ SO_2 __________ CO___________VOC _________________

Toxic(s) (Please List):____

Source Height ________________________ Initial Horizontal Dimension ___________________________

Initial Vertical Dimension ____________________________________

Source ________________

PM_{10} __________ $PM_{2.5}$ _________ NO_x __________ SO_2 __________ CO___________VOC _________________

Toxic(s) (Please List):____

Source Height ________________________ Initial Horizontal Dimension ___________________________

Initial Vertical Dimension ____________________________________

Source ________________

PM_{10} __________ $PM_{2.5}$ _________ NO_x __________ SO_2 __________ CO___________VOC _________________

Toxic(s) (Please List):____

Source Height ________________________ Initial Horizontal Dimension ___________________________

Initial Vertical Dimension ____________________________________

6. Structure Parameters: **(Applies to any and all structures within the property boundary(ies) as well as nearby structures that may influence the dispersion of pollutants emitted by the source(s)).** Units must be noted where appropriate, both English and metric units are acceptable.

Building ______________________

Building Tier No. 1 Height: ______Building Tier No. 1 Length: ______Building Tier No. 1 Width: _______

Building Tier No. 2 Height: ______Building Tier No. 2 Length: ______Building Tier No. 2 Width: _______

Building Tier No. 3 Height: ______Building Tier No. 3 Length: ______Building Tier No. 3 Width: _______

Building ______________________

Building Tier No. 1 Height: ______Building Tier No. 1 Length: ______Building Tier No. 1 Width: _______

Building Tier No. 2 Height: ______Building Tier No. 2 Length: ______Building Tier No. 2 Width: _______

Building Tier No. 3 Height: ______Building Tier No. 3 Length: ______Building Tier No. 3 Width: _______

Building ______________________

Building Tier No. 1 Height: ______Building Tier No. 1 Length: ______Building Tier No. 1 Width: _______

Building Tier No. 2 Height: ______Building Tier No. 2 Length: ______Building Tier No. 2 Width: _______

Building Tier No. 3 Height: ______Building Tier No. 3 Length: ______Building Tier No. 3 Width: _______

Building ______________________

Building Tier No. 1 Height: ______Building Tier No. 1 Length: ______Building Tier No. 1 Width: _______

Building Tier No. 2 Height: ______Building Tier No. 2 Length: ______Building Tier No. 2 Width: _______

Building Tier No. 3 Height: ______Building Tier No. 3 Length: ______Building Tier No. 3 Width: _______

Tank _________________ Tank Height __________________ Tank Diameter _________________

Tank _________________ Tank Height __________________ Tank Diameter _________________

Tank _________________ Tank Height __________________ Tank Diameter _________________

Tank _________________ Tank Height __________________ Tank Diameter _________________

7. Scaled Plot Plan: (Make sure that all of the buildings and tanks shown on the scaled plot plan are also listed in section 6.)

Emission Release Locations:______ Buildings:_____________ (On site and neighboring) Tanks:________________ (On site and neighboring)

Property Boundary(ies):__________ Potential Co-contributor(s):_____________________________

Sensitive Receptors:____________

Note: A sensitive receptor is defined in IDAPA 58.01.01.007.10 as, "any residence, building, or location occupied or frequented by persons who, due to age, infirmity, or health-based criteria, may be more susceptible to the deleterious effects of a toxic air pollutant than the general population including, but not limited to, elementary and secondary schools, day care centers, playgrounds and parks, hospitals, clinics, and nursing homes".

8. Topographic Map Showing:

Source Location(s) ______ Buildings _____________ (On site and neighboring) Tanks ________ (On site and neighboring)

Property Boundary(ies) __________ Model Receptors ________

Maximum Impact Locations______

9. Meteorology Used (upper air and surface data):

Site-Specific:____

A quality control and quality assurance analysis, consistent with EPA guidelines, should be included for any on-site data used other than that supplied by the NWS. Contact DEQ regarding the adequacy of this data before use.

NWS Data Representative of the Site ____________________

10. Land Use Classification:

Urban _________ Rural _________ (DEQ can be contacted for further guidance on source classification)

Justification:

Completeness Determination Questions:

- Was a modeling protocol approved by DEQ prior to permit application? Negotiating a modeling protocol with DEQ assures the general modeling approach will be accepted.

- Is a justification given explaining why a particular dispersion model was used?

- Did you document and justify input parameters and model settings? (Please include a written justification.)

- Were grid receptors placed 100 to 500 meters apart for the initial modeling analysis in order to find the area of maximum impact?

- Were grid receptors placed 25 to 50 meters apart in the area of maximum impact?

- What ambient air quality standards apply (e.g., NAAQS, significance standards, acceptable ambient concentration for carcinogens and non-carcinogens (AACC, AAC, respectively), PSD increment standards)?

- Were DEQ-approved background concentrations included in the modeling analysis (attainment and unclassified areas only)?

Considerations for major pollution sources and sources subject to PSD regulations:

- Was DEQ contacted regarding the need for (and quality control of) pre-construction monitoring data?

- Was a visibility analysis performed?

- Was the area of significant impact documented?

- Were impacts included (on disk) at all integral UTM coordinates within the significant impact area?

- If a major facility (as defined in IDAPA 58.01.01.006.55), was cumulative increment consumption analyzed?

Signature of modeler (please print and sign name) ______________________________

____

Telephone Number ______________________________

Name of DEQ Modeling Contact ______________________________

Telephone Number (208) 373-0502

Appendix D - Modeling Protocol Checklists

Modeling Protocol Checklist
for New Minor Sources or Minor Modifications

Introduction and Purpose

- General overview, facility description, terrain description
- Project overview
- Goals of the air quality impact analysis (i.e., demonstrate compliance for a permit to construct or a Tier II operating permit)
- Applicable regulations and requirements
- Pollutants of concern

Emission and Source Data

- Facility processes and emission controls effected by the permitting action
- Include a list of emission points that will be included in the application
  Present a table showing current actual and future allowable emission rates (in maximum pounds per hour and tons per year) and the requested emission increase (future allowable minus current actual)
- Good engineering practice (GEP) stack-height analysis
- Facility layout: location of sources, buildings, and fence lines
- Source parameters (emissions rates, UTM coordinates, stack height, stack elevation, stack diameter, stack-gas exit velocity, and stack-gas exit temperature) for each new or modified emission point
- Methodology for including area and volume sources in the modeling analysis
- Methodology for including/excluding sources from the modeling analysis

Air Quality Modeling Methodology

- Model selection and justification
- Model setup and application
    - *Model options (i.e., regulatory default)*
    - *Averaging periods*
    - *Land-use analysis*
    - *Building Downwash*
    - *Treatment of chemical transformation (e.g., NO to NO_2)*
    - *Other parameters*

- Elevation data
  - *Methodology for accounting for complex terrain*
- Receptor network
  - *Description of receptor grids – include methodology for ensuring the maximum concentration will be estimated*
  - *Discussion/justification of ambient air*
  - *Determination of receptor elevations*
- Meteorological data
  - *Selection of meteorological databases – justification of appropriateness of meteorological data to area of interest*
  - *Meteorological data processing*
  - *Meteorological data analysis (e.g., wind rose)*
- Background concentrations

Applicable Regulatory Limits

- Methodology for evaluation of compliance with standards (i.e., determination of design concentration)
- Preliminary analysis
  - *Comparison to Idaho SCLs*
  - *TAP analysis*
- Full impact analysis
  - *NAAQS analysis*
- Presentation of results – state how the results of the modeling analysis will be displayed (i.e., list what information will be included)

References

Modeling Protocol Checklist
For New Major Sources or Major Modifications

Introduction and Purpose

- General overview, facility description, terrain description
- Project overview
- Goals of the air quality impact analysis (i.e., demonstrate compliance for a permit to construct)
- Applicable regulations and requirements
- Pollutants of concern

Emission and Source Data

- Facility processes and emission controls effected by the permitting action
- Emission points and emission rates to be included in the application
  Present a table showing current actual and future allowable emission rates (in maximum pounds per hour and tons per year) and the requested emission increase (future allowable minus current actual)
- Good engineering practice (GEP) stack-height analysis
- Facility Layout: location of sources, buildings, and fence lines
- Source parameters (emissions rates, UTM coordinates, stack height, stack elevation, stack diameter, stack gas exit velocity, and stack gas exit temperature) for each new or modified emission point
- Methodology for including area and volume sources in the modeling analysis
- Methodology for including/excluding sources from the modeling analysis
- Methodology for determining other nearby sources to be included in the modeling analysis

Class II Air Quality Modeling Methodology

- Model selection and justification
- Model setup and application
  - *Model options (i.e., regulatory default)*
  - *Averaging periods*
  - *Land-use analysis*
  - *Building Downwash*
  - *Treatment of chemical transformation (e.g., NO to NO_2)*

  - *Other parameters*
- Elevation data
  - *Methodology for accounting for complex terrain*
- Receptor network
  - *Description of receptor grids – include methodology for ensuring the maximum concentration will be estimated*
  - *Discussion/justification of ambient air*
  - *Determination of receptor elevations*
- Meteorological data
  - *Selection of meteorological databases – justification of appropriateness of meteorological data to area of interest*
  - *Meteorological data processing*
  - *Meteorological data analysis (e.g., wind rose)*
- Availability of current air quality data

Additional Impact Analysis (near proposed facility)
- Methodology for performing the following analyses:
  - *Growth analysis*
  - *Ambient air quality impact analysis during construction*
  - *Soil and vegetation impacts*
  - *Visibility impairment*

Class I Air Quality Impact Analysis
- Class I areas of concern
- Air quality related values (AQRVs)
- Modeling procedures
- Model selection and justification
- Model setup and application
- Elevation data
- Receptor network
- Meteorological data set construction
- AQRV calculation procedures

Applicable Regulatory Limits

- Methodology for evaluation of compliance with standards (i.e., determination of the design concentration)
- Preliminary analysis
  - *Comparison to significant monitoring concentrations*
  - *Comparison to Idaho SCLs*
  - *Determination of radius of impact*
  - *TAP analysis*
- Full impact analysis
  - *NAAQS analysis*
  - *Class II PSD increment consumption analysis*
- Class I analysis
  - *AQRV analysis*
- Additional impacts analysis
  - *Growth analysis*
  - *Ambient air quality impact analysis during construction*
  - *Soils and vegetation impacts*
  - *Visibility impairment*
- Presentation of results – state how the results of the modeling analysis will be displayed (i.e., list what information will be included)

References

Appendix E – Land-Use Classification Procedure

Land-Use Classification Procedure

See Section 8.2.8.b of *Guideline on Air Quality Models* (EPA 2001) for additional information.

1) Determine a circular area centered on the source with a radius of 3 kilometers. 2) Classify the land use within this area using the meteorological land-use typing scheme presented in Table D-1. 3) If land-use types I1, I2, C1, R2, and R3 account for 50 percent or more of the area, use urban dispersion coefficients; otherwise, use rural dispersion coefficients.

Table E-1. Identification and Classification of Land-Use Types[a].

Type	Description: Use and Structures	Description: Vegetation
I1	Heavy industrial Major chemical, steel, and fabrication industries; generally 3-5 story buildings, flat roofs	Grass and tree growth extremely rare; <5% vegetation
I2	Light-moderate industrial Rail yards, truck depots, warehouses, industrial parks, minor fabrications; generally 1-3 story buildings, flat roofs	Very limited grass, trees almost total absent; <5% vegetation
C1	Commercial Office and apartment buildings, hotels; >10 story heights, flat roofs	Limited grass and trees; <15% vegetation
R1	Common residential Single family dwellings with normal easements; generally one story, pitched roof structures; frequent driveways	Abundant grass lawns and light-moderately wooded; >70% vegetation
R2	Compact residential Single, some multiple, family dwellings with close spacing; generally <2 story, pitched roof structures; garages (via alley), no driveways	Limited lawn size and shade trees; <30% vegetation
R3	Compact residential Old multi-family dwellings with close (<2m) lateral separation; generally 2 story, flat roof structures; garages (via alley) and ash pits, no driveways	Limited lawn size, old established shade trees; <35% vegetation
R4	Estate residential Expansive family dwellings on multi-acre tracts	Abundant grass lawns and lightly wooded; >80% vegetation
A1	Metropolitan natural Major municipal, state, or federal parks, golf courses, cemeteries, campuses; occasionally single story structures	Nearly total grass and lightly wooded; >95% vegetation
A2	Agricultural rural	Local crops (e.g., corn,

Table E-1. Identification and Classification of Land-Use Types[a].

Type	Description	
	Use and Structures	Vegetation
		soybeans); >95% vegetation
A3	Undeveloped Uncultivated; wasteland	Mostly wild grasses and weeds, lightly wooded; >90% vegetation
A4	Undeveloped rural	Heavily wooded; >95% vegetation
A5	Water surfaces Rivers, lakes	N/A[b]

a. Information from Auer 1978
b. Not applicable

Appendix F - Example Tables for Air Quality Modeling Report

Example Tables for Air Quality Modeling Reports

This appendix contains examples of tables that are useful in presenting information in modeling reports.

Table F-1. Example Stack Parameters Table

Parameter	Generator Stack	Turbine Stack
Computer Model Identifier (Alias)		
Emission Rate (lb/hr)		
Stack Height (ft)		
Stack Diameter (ft)		
Exit Temperature (°F)		
Exit Flow Rate (acfm)		

Table F-2. Example Significant Impacts Summary (PM_{10})

Year	Highest Annual Concentration ($\mu g/m^3$)	Radius of Significant Annual Impact (m)	Highest 24-hour Concentration ($\mu g/m^3$)	Radius of Significant 24-hour Impact (m)
1987				
1988				
1989				
1990				
1991				
Allowable Significant Level	1.0	N/A[a]	5.0	N/A

a. Not applicable

Table F-3. Example Prevention of Significant Deterioration Increment Consumption Summary for Class II Areas

Pollutant	Averaging Period	PSD Increment Consumption ($\mu g/m^3$)	Allowable PSD Increment ($\mu g/m^3$)	Percent of PSD Consumption
PM_{10}	24-hour		30	
PM_{10}	Annual		17	
SO_2	3-hour		512	
SO_2	24-hour		91	
SO_2	Annual		20	
NO_x	Annual		25	

Table F-4. Example Maximum Impacts for NAAQS Analysis (Carbon Monoxide impacts, 8-hour averaging period)								
Year	**Highest 8-hour Concentration ($\mu g/m^3$)**	**Receptor Location**			**Highest, Second Highest 8-hour Concentration ($\mu g/m^3$)**	**Receptor Location**		
		East (m)	**North (m)**	**Elevation (m)**		**East (m)**	**North (m)**	**Elevation (m)**
1987								
1988								
1989								
1990								
1991								

Table F-5. Example Maximum Impacts for Toxic Air Pollutants Analysis (Carcinogens)				
	Highest Annual	**Receptor Location**		
Year	**Concentration ($\mu g/m^3$)**	**East (m)**	**North (m)**	**Elevation (m)**
1987				
1988				
1989				
1990				
1991				

Table F-6. Example Maximum Impacts for Toxic Air Pollutants Analysis (Noncarcinogens).				
	Highest 24-hour	**Receptor Location**		
Year	**Concentration ($\mu g/m^3$)**	**East (m)**	**North (m)**	**Elevation (m)**
1987				
1988				
1989				
1990				
1991				

Table F-7. Example NAAQS and Toxic Air Pollutants Impact Analysis Summary						
		Total Ambient Impact	**Background**	**Total NAAQS**		

Pollutant	Averaging Period	(baseline plus modification) ($\mu g/m^3$)	Concentration ($\mu g/m^3$)	concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	Percent of NAAQS
PM_{10}	24-hour				150	
PM_{10}	Annual				50	
SO_2	3-hour				1,300	
SO_2	24-hour				365	
SO_2	Annual				80	
NO_x	Annual				100	
CO	1-hour				40,000	
CO	8-hour				10,000	
Carcinogen TAP	Annual		N/A			
Noncarcinogen TAP	24-hour		N/A			